

What is claimed is:

- 1 1. A protected component for use in a molten metal bath, the protected component including a  
2 non-coated component and a protective coating and made by the process of:  
3 (a) placing a protective coating on a non-coated component, wherein a space exists between  
4 the non-coated component and the protective coating;  
5 (b) injecting uncured cement into the space; and  
6 (c) allowing the uncured cement to cure, thus adhering the non-coated component to the  
7 protective coating.
- 1 2. The protected component of claim 1 wherein at least some of the uncured cement is injected  
2 into the space through a channel in the non-coated component.
- 1 3. The protected component of claim 1 wherein at least some of the uncured cement is injected  
2 into the space through an opening in the protective coating.
- 1 4. The protected component of claim 1 wherein the protective coating is positioned on the non-  
2 coated component by a beveled lip formed on the non-coated component.
- 1 5. The protected component of claim 4 wherein there is a gasket between the beveled lip and the  
2 protective coating.
- 1 6. The protected component of claim 1 wherein a gasket is positioned between the protective  
2 coating and the non-coated component.
- 1 7. The protected component of claim 1 wherein the non-coated component is comprised of  
2 graphite.
- 1 8. The protected component of claim 1 wherein the protective coating covers only part of the  
2 non-coated component.
- 1 9. The protected component of claim 1 wherein the component is a support post.
- 1 10. The protected component of claim 1 wherein the protective coating is comprised of ceramic.
- 1 11. The protected component of claim 10 wherein the protective coating is comprised of one or

- 2 more of the group consisting of nitride-bonded silicon carbide and aluminum oxide.
- 1 12. The protected component of claim 1 wherein the non-coated component is centered inside the  
2 protective coating.
- 1 13. The protected component of claim 1 wherein the protective coating has a uniform thickness.
- 1 14. The protected component of claim 1 which is a rotor shaft for a molten metal pump.
- 1 15. The protected component of claim 1 which is a rotor shaft for a rotary degasser.
- 1 16. The protected component of claim 1 which is a rotor shaft for a scrap melter.
- 1 17. The protected component of claim 1 which is a support post for a molten metal pump.
- 1 18. The protected component of claim 1 which is a metal-transfer conduit for a molten metal  
2 pump.
- 1 19. The protected component of claim 1 which is a gas-transfer conduit for a molten metal pump.
- 1 20. The protected component of claim 1 which is a pump base for a molten metal pump.
- 1 21. The protected component of claim 1 which is a rotor for a molten metal pump.
- 1 22. A device for pumping or otherwise conveying molten metal, the device including:  
2 (a) a superstructure supporting a drive source;  
3 (b) a drive shaft having a first end and a second end, the first end connected to the drive  
4 source;  
5 (c) a pump base including an inlet, a pump chamber, and a discharge;  
6 (d) one or more support posts connecting the pump base to the superstructure; and  
7 (e) an impeller attached to the second end of the drive shaft, the impeller positioned at least  
8 partially within the pump chamber;  
9 wherein one or more of the group consisting of: the drive shaft, the pump base, the one or  
10 more support posts and the impeller is a protected component according to claim 1.
- 1 23. The device of claim 22 wherein the drive shaft comprises:  
2 (a) a motor shaft having a first end and a second end, the first end connected to the drive  
3 source;

- 4 (b) a coupling having a first coupling member and a second coupling member, the first  
5 coupling member connected to the second end of the motor shaft, and  
6 (c) a rotor shaft having a first end and second end, the first end of the rotor shaft connected to  
7 the second coupling member and the second end of the rotor shaft connected to the rotor.
- 1 24. The device of claim 22 that further includes a gas-transfer conduit having a first end connected  
2 to a gas source and a second end for releasing gas into molten metal.
- 1 25. The device of claim 24 wherein the gas-transfer conduit is a protected component according to  
2 claim 1.
- 1 26. The device of claim 22 that further includes a metal-transfer conduit downstream of the  
2 discharge.
- 1 27. The device of claim 26 wherein the metal-transfer conduit is a protected component according  
2 to claim 1.
- 1 28. The device of claim 26 that further includes a gas-transfer conduit having a first end connected  
2 to a gas source and a second end for releasing gas into molten metal.
- 1 29. The device of claim 22 wherein each protected component includes a non-coated component  
2 comprised of graphite.
- 1 30. The device of claim 29 wherein each protected component includes a protective coating  
2 comprising a material selected from one or more of the group consisting of nitride-bonded  
3 silicon carbide and aluminum oxide.
- 1 31. The device of claim 22 wherein the non-coated component of each protected component is  
2 only partially covered with the protective coating.
- 1 32. The device of claim 22 wherein the rotor shaft is a protected component according to claim 1.
- 1 33. The device of claim 22 wherein one of the one or more support posts is a protected component  
2 according to claim 1.
- 1 34. A device for use in molten metal, the device including:  
2 (a) a drive source;

- 3 (b) a drive shaft having a first end connected to the drive source and a second end; and  
4 (c) an impeller connected to the second end of the drive shaft.  
5 wherein one or more of the group consisting of the drive shaft and the impeller is a protected  
6 component according to claim 1.
- 1 35. The device of claim 34 wherein the device is a rotary degasser.
- 1 36. The device of claim 34 wherein the device is a scrap melter.
- 1 37. The device of claim 34 wherein the drive shaft is a protected component according to claim 1  
2 and includes a non-coated component comprised of graphite and a protective coating  
3 comprised of one or more of the group consisting of nitride-bonded silicon carbide and  
4 aluminum oxide.
- 1 38. The device of claim 37 wherein the protective coating covers part of the non-coated  
2 component.
- 1 39. The device of claim 34 wherein the impeller is a protected component according to claim 1.
- 1 40. A protected component for use in molten metal, the protected component comprising a non-  
2 coated component and a refractory coating surrounding at least part of the non-coated  
3 component.
- 1 41. The protected component of claim 40 that is made by the process of:  
2 (a) placing the non-coated component on a vibrating table;  
3 (b) placing a mold around the non-coated component, there being a space between the mold  
4 and the non-coated component;  
5 (c) using a funnel to direct uncured refractory into the space; and  
6 (d) allowing the refractory to cure thus forming a protected component having a refractory  
7 coating.
- 1 42. The protected component of claim 41 wherein the mold is comprised of plaster.
- 1 43. The protected component of claim 41 wherein the mold is comprised of cardboard.
- 1 44. The protected component of claim 40 wherein the protected component is a support post.

- 1 45. The protected component of claim 40 wherein the protected component is a rotor shaft.
- 1 46. The protected component of claim 40 wherein the funnel is part of the mold.
- 1 47. The protected component of claim 40 wherein the refractory coating covers part of the non-  
2 coated component.
- 1 48. The protected component of claim 40 wherein the process further comprises the step of  
2 separating the mold from the protected component.
- 1 49. The component of claim 40 wherein the refractory coating does not cover all of the non-coated  
2 component.
- 1 50. The protected component of claim 40 that is made by the process of:  
2 (a) placing a mold around the non-coated component, there being a space between the mold  
3 and the non-coated component;  
4 (b) injecting refractory into the space; and  
5 (c) allowing the refractory to cure thus forming a protected component having a refractory  
6 coating.
- 1 51. The protected component of claim 50 wherein the process further includes the step of  
2 separating the mold from the protected component.
- 1 52. The protected component of claim 50 wherein the protected component is a support post.
- 2 53. A device for pumping or otherwise conveying molten metal, the device including:  
3 (a) a superstructure supporting a drive source;  
4 (b) a drive shaft having a first end and a second end, the first end connected to the drive  
5 source;  
6 (c) a pump base including an inlet, a pump chamber, and a discharge;  
7 (d) one or more support posts connecting the pump base to the superstructure; and  
8 (e) an impeller attached to the second end of the drive shaft, the impeller positioned at least  
9 partially within the pump chamber;  
10 wherein one or more of the group consisting of: the drive shaft, the pump base, the one or

11 more support posts and the impeller is a protected component according to claim 40.  
12 54. The protected component of claim 40 that is made by the process of:  
13 (a) placing a mold around the non-coated component, there being a space between the mold  
14 and the non-coated component;  
15 (b) directing uncured refractory into the space; and  
16 (c) vibrating the non-coated component or the mold to assist in the movement of the refractory  
17 into the space.  
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